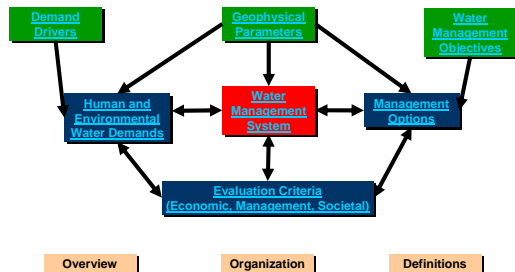


Conceptual Framework for Assessing Water Resources and Management



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Organizing Information

Given the large quantity and complexity of data, relationships, and estimates desired, the update team has organized the requested information according to their potential interactions. The color key below explains the high-level interactions illustrated by the graphical Conceptual Framework.

- The three light green boxes across the top represent *static* information set by the user, which does not change for a given scenario.
- The three blue boxes contain information that will be quantified using analytical tool(s) that explicitly consider the inter-relationships with other data, relationships, or estimates (or *dynamic* estimates).
- The red box in the center represents where most of the decisions are made within the analytical tools (often called decision variables).

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Overview (1 of 2)

DWR and the Water Plan Advisory Committee developed a new planning framework that identifies broad objectives for the Water Plan including disclosure of all technical assumptions (see Chapter 1, Volume 1 of Update 2004). DWR and the Advisory Committee held several workshops with land use and resource planners, academics, policy analysts, and technical experts to build on and affirm Advisory Committee understanding about issues critical for the Water Plan to address. These conversations have been captured in mind maps that represent a web of relationships and ideas (See the Technical Guide, Volume 5). These discussions identified the desire to address various crosscutting issues such as environmental objectives, land-use planning, and economics in different scenarios in this Water Plan. Quantifying these issues will require significantly more technical and quantitative information than for previous Water Plans.

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Definitions (1 of 3)

- Demand Drivers** – Factors that influence the calculation of water demands, which are not directly controlled by water management activities. For example, population, population density, land use patterns, and economic activity.
- Geophysical Parameters** – Factors that represent the basic hydrology, hydrogeology, geology, and climate, which form the natural constraints of the system. For example, precipitation, soil properties, and aquifer transmissivity.
- Water Management Objectives** – Objectives developed by policy makers for desired outcomes of the water management system while considering the various constraints, competing demands, and resource strategies. For example, desired water quality and desired water reliability at a particular location and time and for a particular use.

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Overview (2 of 2)

Types of technical assumptions and information needs that have been identified to satisfy the broad objectives of the Water Plan can be described as:

- Data** – factual (or observed) information, such as measurements or statistics (e.g., gauged flows in a river, population as measured by census, and salinity of a water sample). Sets of data can be *raw* (as taken from measurement devices) or *elaborated* (modified slightly as part of quality assessment and quality control measures, or *interpreted* (supplemented to address missing measurements).
- Relationships** (or system interactions) – descriptions of how the social, physical, and environmental systems affect or are affected by the status of water supply and water use in California (e.g., how releases from a reservoir affect water temperature at a point in a river downstream, the irrigated crop acreage in a region and the expected market conditions for each crop, and snow pack conditions in February and the delivery of SWP water).
- Estimates** – inferred, derived and/or forecasted quantities based on available data, defined relationships, and other assumptions (e.g., population forecasts for the Los Angeles area in 2030, groundwater flows between sub basins, future available water deliveries, and the cost to implement water conservation best management practices).

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Definitions (2 of 3)

- Human and Environmental Demands** – Dynamic consumptive and non-consumptive demands for water that fluctuate based on the climate, economy, changes in water use efficiency, population growth, and other factors. Consumptive demands include activities that deplete water from the water management system by evaporation, evapotranspiration, or flows to saline water bodies. Non-consumptive demands include activities that require a specific quantity of water at a particular location and time, but do not deplete from the water management system. This includes releasing water for hydropower production, instream flows, or municipal water use that flows to a wastewater treatment facility and is later released to a stream or recharged to groundwater.
- Management Options** – Management options are the numerous resource strategies available to water managers to improve operation of the water management system and are heavily influenced by the desired water management objectives. This includes actions like water use efficiency, surface or groundwater storage, floodplain management, and ecosystem restoration.

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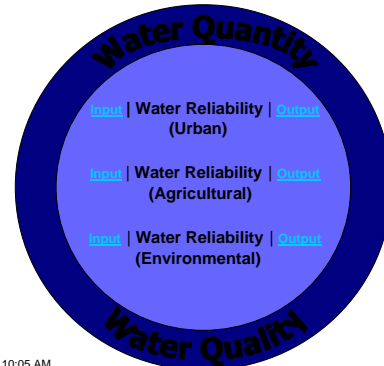
Definitions (3 of 3)

- **Evaluation Criteria** – Factors that serve as dynamic evaluation criteria to guide policy makers, water managers, and the public about how well a particular hypothetical scenario and operation of the water management system is at meeting water management objectives. This includes things like economic cost of implementing different resource strategies, environmental benefits, water reliability, and improvements in water quality.
- **Water Management System** – The system of man made and natural water storage and conveyance features where the water management decisions are implemented. This includes location, storage and flow capacities, and operating criteria of reservoirs, canals, wetlands, floodplains, lakes, rivers, and groundwater basins.

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EVALUATION CRITERIA (1 of 4)

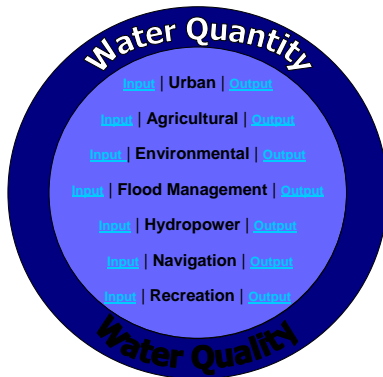


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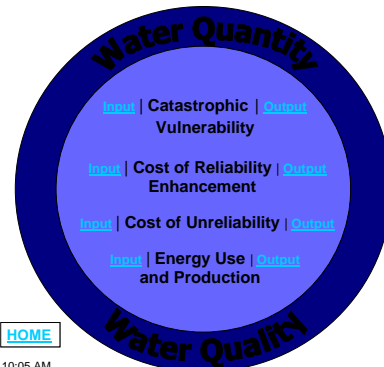
WATER DEMANDS



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EVALUATION CRITERIA (2 of 4)



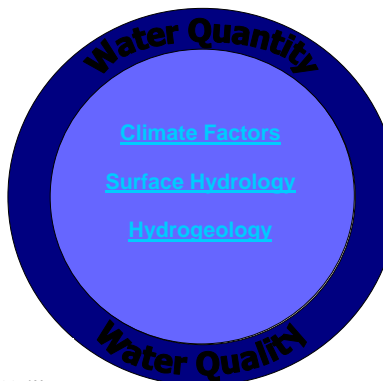
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GEOPHYSICAL PARAMETERS



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EVALUATION CRITERIA (3 of 4)



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EVALUATION CRITERIA (4 of 4)



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HYDROGEOLOGY

Factors

- Aquifer Types
 - Confined
 - Unconfined
 - Perched
 - Isotropic
 - Anisotropic
- Aquifer Permeability / Hydraulic Conductivity
- Subsidence
- Groundwater elevation
- Piezometric Surface/Pore Pressure
- Aquifer Transmissivity
- Storativity
- Stratigraphy
- Porosity
- Aquifer Homogeneity / Heterogeneity
- Connection to surface water bodies
- Aquifer Zones & Depths

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WATER MANAGEMENT SYSTEM



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SURFACE HYDROLOGY

Factors

- Precipitation (intensity, duration, frequency)
- Upper basin shape, size and topography
- Basin soil type
- Basin soil erosion
- Streambed grain size distribution
- Stream bank stability and bank grain size distribution
- Soil infiltration
- Land use (vegetation cover, pavement)
- Surface vegetation ET
- Lower basin ground slope
- Stream channel shape and slope
- Snow accumulation
- Stream reach rating curve

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CLIMATE

Factors

- Net Solar radiation
- Air Temperature
- Relative Humidity
- Wind speed
- Dew point temperature
- Cloud cover
- Evaporative Demand
- Microclimates – temporal/spatial variations

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WATER MANAGEMENT SYSTEM

Input (1 of 4)

- Applied water demands for ag/urban/env uses
- Available / desired / required water quality (stream, lake, aquifer)
- Stream inflows at system boundary
- Location, operating criteria, and capacities of reservoirs, conveyance facilities, and natural channels, recharge facilities, and groundwater basins
- Institutional response to drought, climate change, and catastrophic events

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WATER MANAGEMENT SYSTEM

More Input (2 of 4)

- Stream rating curves
- Desired / required instream flow and lake levels
- Available / desired / required water temperature
- Stream flow velocities, streambed grain size, bank stability, bank material grain size
- Available water management strategies and operating criteria

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WATER MANAGEMENT SYSTEM

Output (1 of 3)

- Agricultural/Urban/Environmental recreation, navigation, hydropower water use
- Water quality by source
- Strategy implementation
- Streamflows and timing by reach
- Surface water reservoir inflow, releases, storage level, losses
- Groundwater recharge, pumping, subsurface inflow/outflow, storage levels
- Source of water for deliveries

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WATER MANAGEMENT SYSTEM

More Input (3 of 4)

- Groundwater well location, capacities, operation criteria, and ordinances
- Groundwater management objectives
- Location and capacity of water and wastewater treatment facilities
- Interconnectedness of local, regional, state water systems

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WATER MANAGEMENT SYSTEM

More Output (2 of 3)

- Stream-Aquifer interaction
- Return flows by reach
- Water temperature by stream reach / lake level
- Sediment transport by stream reach
- Deep percolation of applied water and precipitation
- Conveyance losses
- Extent of Ag drainage problems
- Hydropower generation
- Volume of water and wastewater treatment

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WATER MANAGEMENT SYSTEM

More Input (4 of 4)

- Geology and hydrogeology info
 - Specific yield
 - Transmissivity
 - Aquifer zones / depths
 - Artificial recharge areas / capacities
 - Natural recharge areas / capacities
- Operating criteria for managed wetlands including flood-up and drawdown

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WATER MANAGEMENT SYSTEM

More Output (3 of 3)

- Water quality of discharges to surface water and groundwater

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ENVIRONMENTAL WATER DEMANDS

Input (1 of 3)

- Acreage and location of riparian, refuge, wetland habitats
- ET of riparian, managed refuge, and wetland habitats
- Inventory of fish and wildlife dependent on riparian, refuge, or wetland habitat (abundance, locations, habitat needs, water quality needs, temperature needs)
- Available water supplies by source

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ENVIRONMENTAL WATER DEMANDS

Output (1 of 2)

- Total and applied water demands for riparian, refuge, and wetland habitat
- Desired instream flow and lake levels in specific stream reaches and lakes to sustain riparian, refuge, and wetland habitat
- Desired water quality in specific stream reaches and lakes to sustain riparian, refuge, and wetland habitat
- Desired water temperature in specific stream reaches and lakes to sustain riparian, refuge, and wetland habitat

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ENVIRONMENTAL WATER DEMANDS

More Input (2 of 3)

- Fish and wildlife biological objectives for abundance, locations, habitat needs, water quality needs, temperature needs
- Fish and wildlife legal requirements for abundance, locations, habitat needs, water quality needs, temperature needs
- Historical information on river flow, riparian habitat, bank erosion, and channel movement by reach
- ET/ETAW of applied water demands for riparian, refuge, and wetland habitats

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ENVIRONMENTAL WATER DEMANDS

More Output (2 of 2)

- Desired instream flow and lake level requirements to sustain fish and wildlife species
- Desired water quality in specific stream reaches and lakes to sustain fish and wildlife species
- Desired water temperature in specific stream reaches and lakes to sustain fish and wildlife species
- Desired instream flows in specific stream reaches and lakes to maintain river morphology

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ENVIRONMENTAL WATER DEMANDS

More Input (3 of 3)


- Inventory of management practices of refuges and managed wetlands
 - Habitat type including vegetation and open water
 - Required / desired water depths
 - Required / desired water circulation
- Other water related environmental objectives
- Effective precipitation
- Existing commitments for future water use efficiency at managed wetlands
- Legal requirements for abundance, locations, habitat, flow, water quality, and temperature

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AGRICULTURAL WATER DEMANDS

Input (1 of 4)

- [Climate Factors](#) 
- Population and population growth
- Crop ET & ETAW modeling
 - Soil type
 - Available soil moisture holding capacity
 - Soil depth
 - Growing season
 - Crop coefficients
 - Rooting depth
 - Managed allowable depletion
 - Soil infiltration
 - Deficit irrigation

Net Solar radiation
Air Temperature
Relative Humidity
Wind speed
Cloud cover
Precipitation
Evaporative Demand
Dewpoint temperature
Microclimates – temporal / spatial variation

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AGRICULTURAL WATER DEMANDS

More Input (2 of 4)

- Crop type
- Regional crop practices
- Soil salinity (leaching requirements) / Planned over-irrigation
- Soil water holding capacity/ Soil moisture retention
- Agricultural Practices (Permanent, Row, Multiple Crops)
- Land availability, suitability
 - Conservation easements
 - Flood control easements
 - Urbanization

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AGRICULTURAL WATER DEMANDS

Output

- Crop production (tonnage)
- Total Ag Water Demand
- Water quality requirements for surface water / groundwater deliveries
- Total Ag ET / ETAW / EP

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AGRICULTURAL WATER DEMANDS

More Input (3 of 4)

- Effective precipitation
- Available water supplies by source
- Cost of water supplies by source
- Available water quality by source
- Irrigation method
- Consumed fraction
- Existing commitments for future water use efficiency
- Crop pattern
- Crop acreage

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RECREATION

Input

- What type of recreational activities (water contact / non-water contact)
- Where recreational activities take place
- When recreational activities take place
- Annual number of people who participate in recreational activities
- Future population / recreational usage

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AGRICULTURAL WATER DEMANDS

More Input (4 of 4)

- Current drainage problems/High water table areas
- Livestock water use (Number and type of livestock)
- Applied water reusable fraction
- Water quality needs for plant production by crop type
- Cultural practices

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RECREATION

Output

- Time and quantity of stream flows required to support stream-based recreation
- Timing and lake levels required to support lake-based recreation
- Desired / required water quality to support recreation
- Desired / required fish and wildlife abundance to support recreation
- Desired / required habitat to support recreation

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HYDROPOWER

Input

- Forecast of hourly reservoir inflows
- Forecast of hourly power usage and generation
- Forecast of hourly power market rates
- Location, storage capacity, conveyance capacity, and generation capacity of hydropower facilities
- Operating criteria for hydropower facilities
- Water quality, water temperature, and recreational requirements affecting hydropower facilities
- Trends / changes in hydropower operation due to FERC re-licensing and other legal requirements

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FLOOD MANAGEMENT

Output

- Desired / required reservoir storage levels and releases for flood management

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HYDROPOWER

Output

- Desired reservoir releases for hydropower generation
- Maximum potential hydropower generation
- Maximum potential hydropower consumption

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URBAN WATER DEMAND

Input (1 of 2)

- [Climate Factors](#) → Net Solar radiation
Air Temperature
Relative Humidity
Wind speed
Cloud cover
Precipitation
Evaporative Demand
Dewpoint temperature
Microclimates – temporal / spatial variation
- Available water supplies by source
- Cost of water supplies by source
- Population and growth rate (by class, dwelling, etc.)
- Unit indoor/outdoor use (per capita, per household, etc.)
- Required water quality for urban uses

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FLOOD MANAGEMENT

Input

- Forecast of hourly reservoir inflows
- Location, operating criteria, and capacities of flood management facilities
- Regulatory storage and release requirements for flood management
- Management policies (e.g., State Floodplain Management Task Force)
- Land use policies

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URBAN WATER DEMAND

More Input (2 of 2)

- Housing and land use characteristics (density, mix, availability, suitability, policies)
- Available water quality by source
- Existing commitments for future water use efficiency
- Economic characteristics (employment, commercial, industrial, household income, etc.)

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URBAN WATER DEMAND

Output

- Water demand by customer class (single family, multifamily, commercial, industrial, landscape)
- Water demand for landscaping
- Water quality requirements for surface water / groundwater deliveries
- Water use reduction due to conservation programs

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NAVIGATION REQUIREMENTS

Output

- Instream flow and lake level requirements to meet navigation requirements

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DEMAND DRIVERS

Factors

- | | |
|---------------------------------|---|
| • Total population | • Total crop area (Includes multiple cropping) |
| • Population density | • Crop unit water use |
| • Population distribution | • Existing commitments for future water use efficiency |
| • Commercial activity | • Land use |
| • Commercial activity mix | • Per capita income |
| • Total industrial activity | • Seasonal / permanent irrigated crop acreage and land acreage. |
| • Total industrial activity mix | |
| • Agricultural production | |

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MANAGEMENT OPTIONS

- | | |
|---|------------------------------------|
| • Ag. Lands Stewardship | • Precipitation Enhancement |
| • Agricultural Use Efficiency | • Recharge Area Protection |
| • Conj. Mgmt / GW Storage | • Recycled Municipal Water |
| • Conveyance | • Surface Storage – CALFED |
| • Desalination | • Surface Storage – Regional/Local |
| • Drinking Water Treatment & Distribution | • System Reoperation |
| • Economic Incentives/ Pricing | • Urban Land Use Management |
| • Ecosystem Restoration | • Urban Runoff Management |
| • Floodplain Management | • Urban Water Use Efficiency |
| • GW / Aquifer Remediation | • Water-Dependent Recreation |
| • Matching WQ to Use | • Water Transfers |
| • Pollution Prevention | • Watershed Management |
| | • Other Strategies (R&D) |

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NAVIGATION REQUIREMENTS

Input

- Inventory of legal and desired flow requirements by stream reach and lake for navigation

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WATER MANAGEMENT OBJECTIVES

Objectives

- | | |
|---|---|
| • Demand Reduction, Reallocation of Supply, and Supply Augmentation | • Energy Benefits |
| • Improve Drought Preparedness | • Recreational Opportunities |
| • Improve Water Quality | • Reduce Groundwater Overdraft |
| • Operational Flexibility & Efficiency | • Reduce Pollution |
| • Reduce Flood Impacts | • Reduce Ag Drainage Impacts |
| • Environmental Benefits | • Fish and wildlife objectives for abundance, locations, habitat flow, water quality, and temperature |

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EVALUATION CRITERIA: WATER RELIABILITY (URBAN)

Input

- Population
- Water rates
- Housing type
- Price elasticity
- Willingness to accept shortages
- Willingness to pay to avoid shortages
- Contingency options
- Actual water deliveries
- Requested water deliveries
- Evaluated mix of water management options
- Desired/Required water quality
- Land use
- Land suitability
- Unit cost for water treatment
- Pumping cost

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EVALUATION CRITERIA : WATER RELIABILITY (AGRICULTURAL)

Output

- Water supply exceedence curve
- Profitability
- Economic sustainability
- Agricultural production (\$)
- Employment
- Effects of land use on agricultural water use

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Evaluation Criteria: WATER RELIABILITY (URBAN)

Output

- Water supply exceedence curve
- Commercial and industrial activity
- Business production
- Employment
- Relationship between development density and water use

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EVALUATION CRITERIA : WATER RELIABILITY (ENVIRONMENTAL)

Input

- Ecosystem needs (timing, temperature, quality, location, etc.)
- Willingness to pay to avoid shortages
- Cost of avoiding shortages
- Actual water deliveries
- Requested water deliveries
- Evaluated mix of water management options
- Desired/Required water quality

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EVALUATION CRITERIA : WATER RELIABILITY (AGRICULTURAL)

Input

- Irrigated land acreage
- Irrigated crop acreage
- Water rates
- Crop market demand
- Water quality
- Drainage cost
- Willingness to accept shortages
- Ability to pay to avoid shortages
- Actual water deliveries
- Requested water deliveries
- Evaluated mix of water management options
- Desired/Required water quality
- Land suitability
- Agricultural practices
- Pumping cost

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EVALUATION CRITERIA : WATER RELIABILITY (ENVIRONMENTAL)

Output

- Species recovery
- Overall habitat condition
- Description of met and unmet environmental objectives
- Water supply exceedence curve

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EVALUATION CRITERIA : CATASTROPHIC VULNERABILITY

Input

- Seismicity
- Geology
- System redundancies
- Facility integrity
- Contingency plans
- Emergency supplies
- Forest fuel load
- Probability of a catastrophic events occurring at a specific location for a planning horizon
- Evaluated mix of water management options

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EVALUATION CRITERIA: COST OF RELIABILITY ENHANCEMENT

More Input (2 of 2)

- Wholesale and retail water rates
- Actual implementation of water management strategies
- Areal extent of flood inundation
- Actual stream flow, lake level
- General demographic information
- Economic impacts associated with catastrophic and extreme hydrologic events
- Unit cost for water supplies by source
- Unit cost for water treatment

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EVALUATION CRITERIA: CATASTROPHIC VULNERABILITY

Output

- \$ at risk
- Threat to achieving or maintaining water management objectives (water reliability, water quality, etc.)

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EVALUATION CRITERIA: COST OF RELIABILITY ENHANCEMENT

Output

- Total and marginal cost of different water management strategies
- Undesirable consequences depicted in other evaluation criteria
- Pumping cost
- Treatment cost (for all sources of supply)
- Distribution costs

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EVALUATION CRITERIA: COST OF RELIABILITY ENHANCEMENT

Input (1 of 2)

- Cost of resource management strategies
 - Capital
 - Operations
 - Maintenance
 - Mitigation
 - Program
 - Etc.
- Total and unit water uses (per capita, household, etc.)
- Interest rates

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EVALUATION CRITERIA: COST OF UNRELIABILITY

Input (1 of 3)

- All foregone use-related costs and losses (a function of shortage-management response type)
- Local, regional, and statewide economic objectives
- Irrigated land acreage, irrigated crop acreage, crop type, agricultural practices
- Crop market demand
- Employment characteristics
- Land use
- Land suitability

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EVALUATION CRITERIA: COST OF UNRELIABILITY

More Input (2 of 3)

- Population
- Housing characteristics
- Willingness to pay to avoid water shortages among all users
- Actual implementation of water management strategies
- Areal extent of flood inundation
- Actual stream flow, lake level
- General demographic information

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EVALUATION CRITERIA: COST OF UNRELIABILITY

More Output (2 of 3)

- \$ lost from reductions in
 - Economic activity
 - Quality of life
 - Other social benefits
- Beneficiaries of implemented water management strategies
- Effects of water management strategies on different sectors/demographic groups
- Crop production cost

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EVALUATION CRITERIA: COST OF UNRELIABILITY

More Input (3 of 3)

- Economic impacts associated with catastrophic and extreme hydrologic events
- Unit cost for water supplies by source
- Unit cost for water treatment

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EVALUATION CRITERIA: COST OF UNRELIABILITY

More Output (3 of 3)

- Pumping cost
- Treatment cost (for all sources of supply)
- Cost of agricultural drainage

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EVALUATION CRITERIA: COST OF UNRELIABILITY

Output (1 of 3)

- Statewide and regional benefits, direct & indirect costs, and trade offs associated with implementing different groups of strategies
 - Estimated agricultural production (dollars)
 - Estimated business production by sector
 - Water rates
 - Recreation, public trust responsibilities, fish and wildlife, habitat, water quality, temperature, power production, flood, protection
 - Employment

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EVALUATION CRITERIA: ENERGY USE AND PRODUCTION

Input

- Treatment
- Conveyance / distribution
- Pressurization
- Requirements for environment
- Recreation
- Flood management
- Water supply
- Carryover storage
- Evaluated mix of water management options

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EVALUATION CRITERIA: ENERGY USE AND PRODUCTION

Output

- Hydroelectric production

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EVALUATION CRITERIA: FLOOD MANAGEMENT

Input

- Historical or synthesized hydrology
- Land use
- System operations criteria
- Evaluated mix of water management options
- Flood inundation area
- Actual stream flow, lake level
- Actual surface water and groundwater storage
- Economic impacts associated with catastrophic and extreme hydrologic events

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EVALUATION CRITERIA: ENVIRONMENTAL JUSTICE

Input

- Evaluated mix of water management options
- Environmental justice goals
- Demographic information
 - poverty status; unemployment; occupation; education – highest attainment; culture; gender, head of household, age of householders (such as many children under age 5), housing density, race, etc.

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EVALUATION CRITERIA: FLOOD MANAGEMENT

Output

- Areas of flood inundation
- Flood risk

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EVALUATION CRITERIA: ENVIRONMENTAL JUSTICE

Output

- \$ at risk
- Threat to water reliability
- Water quality
- Energy use
- Effects of water management strategies on different sectors/demographic groups

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EVALUATION CRITERIA: GROUNDWATER OVERDRAFT

Input

- Historical or synthesized hydrology
- Hydrogeology
- Land use
- Evaluated mix of water management options
- Available surface water and groundwater storage
- Groundwater recharge and pumping
- Subsurface inflow and outflow
- Stream-aquifer interaction
- Induced subsidence potential

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EVALUATION CRITERIA: GROUNDWATER OVERDRAFT

Output

- Groundwater overdraft and safe yield
- Land subsidence

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EVALUATION CRITERIA: RECREATION

Input

- Storage and conveyance operations
- Type and timing of recreation demand (stream flows, lake levels)
- Evaluated mix of water management options
- Desired/Required water quality
- Recreation demographics (who does what, when, and how much)

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EVALUATION CRITERIA: PUBLIC TRUST

Input

- Historical or synthesized hydrology
- System operations criteria
- Evaluated mix of water management options
- Public trust responsibilities by stream reach/water of body (required flows, fisheries, water quality)

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EVALUATION CRITERIA: RECREATION

Output

- Sport fish conditions
- Water-based recreational opportunities
- Reliability of recreational water supplies

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EVALUATION CRITERIA: PUBLIC TRUST

Output

- Impacts to public trust responsibilities including waterway navigability, fisheries, water quality

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EVALUATION CRITERIA: REGIONAL SELF-SUFFICIENCY

Input

- Current regional supply reliability
- Current volume of imports from other hydrologic regions during dry years
- Evaluated mix of water management options

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EVALUATION CRITERIA: REGIONAL SELF-SUFFICIENCY

Output

- Volume of imports from other hydrologic regions during droughts with implemented water management options

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EVALUATION CRITERIA: TRIBAL RESOURCES

Input

- Evaluated mix of water management options
- Water rights held by Indian tribes

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EVALUATION CRITERIA: THIRD PARTY IMPACTS

Input

- Groundwater levels
- Groundwater recharge and pumping
- In-stream flows
- Diversions
- Land following
- Evaluated mix of water management options
- Water rights
- Dynamics of stream-aquifer systems
- Pumping costs

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EVALUATION CRITERIA: TRIBAL RESOURCES

Output

- Impacts to water rights held by Indian tribes
- Impacts to water quality

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EVALUATION CRITERIA: THIRD PARTY IMPACTS

Output

- Increased pumping costs
- Environmental impacts
- Employment type and rate
- Tax revenues
- Retail sales of agricultural goods and services
- Effects on water rights

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EVALUATION CRITERIA: WATER QUALITY

Input

- Evaluated mix of water management options
- Desired/Required water quality by stream reach
- Water body
- Water diversion location
- Unit cost of water treatment

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EVALUATION CRITERIA: WATER QUALITY

Output

- Water quality by stream reach
- Water quality by water body
- Water quality by diversion location
- Treatment cost (for all sources of supply)
- Cost of Ag drainage
- Cost of water and wastewater treatment based on future water quality requirements

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